TWO NEW SPECIES OF *MICRONECTA* KIRKALDY (HETEROPTERA: CORIXIDAE) FROM VICTORIA, AUSTRALIA

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Abstract

Two new species of water bug from southern Victoria, *Micronecta dixonia* sp. nov. and *M. concordia* sp. nov. are described and illustrated and their acoustic signals briefly described. They are sympatric species and were found in dams with up to four other *Micronecta* species. Although similar morphologically, they have different acoustic signals. *M. tasmanica* Wroblewski, stat. nov. and *M. illiesi* Wroblewski, stat. nov. are regarded as species, not subspecies of *M. annae* Kirkaldy.

Introduction

There are 14 species and 3 subspecies of *Micronecta* Kirkaldy previously known in Australia, with 3 species and 2 subspecies recorded from Victoria (Hale 1922, Chen 1965, Wroblewski 1970, 1972, 1977). Two new species were discovered during research into sounds and acoustic behaviour of *Micronecta* found near Melbourne (in shallow water at the edges of farm dams in the Dixon's Creek area, 60 km NE of Melbourne). Results of sound analysis of the males of several species will be reported elsewhere but brief diagnostic acoustic signal descriptions of the new species are included here.

Materials and methods

Body length was measured to the posterior tip of the hemelytra, since after death the abdomen is often extended well beyond its normal length. In live bugs, the tips of the lobes of the eighth abdominal segment protrude slightly beyond the hemelytra. For comparing interocular distance with eye width, eye width is described both qualitatively (maximum width along the central axis of the eye) and quantitatively (Wroblewski's (1972) eye width, defined as half the difference between head width and interocular space). Measurements of strigils and of ridges on the basal process of right parameres were made from SEMs.

Sound recordings were made in the laboratory using a Bruel & Kjaer 8103 hydrophone, a high-gain matching amplifier (Melbuni-ews) and a Sony TC-510-2 tape-recorder with tape speed of 19 cm/sec. These recordings were analysed on a Kay Elemetrics Corp DSP Sonagraph Model 5500. *Micronecta* acoustic signals consist of one or usually more pulse-trains, each pulse-train being a group of pulses (as seen on oscillograms or waveforms). Inter-pulse-train interval (IPTI), the time from the start of one pulse-train to the start of the next, is the main signal parameter which distinguishes between the males of different species.

The genus *Micronecta* Kirkaldy

Individuals of the subfamily Micronectinae are much smaller than other corixids and in Australia are all included in the genus *Micronecta*. Most species are 3-4 mm in length, with none over 5 mm. The antennae are 3-

jointed and the scutellum is small. The anterior tarsus in males has a large flattened claw (palar claw) which folds back into a groove on the tarsus. The abdomen is symmetrical in females and asymmetrical to the right in males.

Micronecta species are common in inland fresh waters throughout Australia, especially near the edges of water bodies. They spend most of the time on the bottom mud or amongst vegetation, occasionally surfacing to replenish the respiratory air bubble. Due to buoyancy caused by the air bubble they cling to plants, submerged objects or bottom material when not swimming. Micronectids are good fliers and can migrate between water bodies.

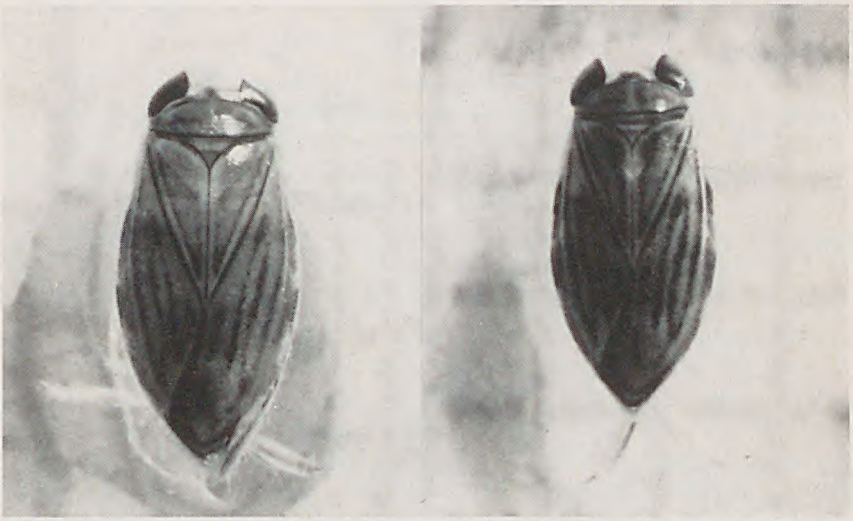

Fig. 1. *Micronecta* spp., photographed under same lighting conditions: left, *M. dixonia* sp. nov., holotype male (length 3.5 mm); right, *M. concordia* sp. nov., paratype male (length 3.2 mm).

Micronecta dixonia sp. nov. (Figs 1, 2)

Types. VICTORIA: Holotype ♂, from a 20 m length of bank in a dam below Paul's Lane, 300 m N of Beach's Lane, Dixon's Creek, 14.vii.1992, I. King. Paratypes: 3 ♂♂, same data as holotype (all in Museum of Victoria, Melbourne).

Description of male. Macropterous; body length 3.4-3.6 mm (mean 3.53, SD 0.09, n=8); body width 1.6-1.7 mm (mean 1.65, SD 0.03, n=8); length to width ratio 2.1-2.2 (mean 2.14, SD 0.04, n=8).

Colour and markings of live males (and in alcohol in parentheses). Head light ochre with a median, longitudinal, faint, thin reddish line (not usual in alcohol); posterior margin suffused with smoky brown and with a small dark central tubercle. Pronotum sometimes with several slight transverse wrinkles

when dry, medium brown, with a darker brown fascia (absent or faint in alcohol) interrupted medially; posterior edge dark. Hemelytra light ochre brown background; clavus with brown markings (less distinct in alcohol) sub-parallel to margins, anterior section lighter, with a large, slightly darker, smoky central area; corium with 4 longitudinal dark brown streaks (fainter in alcohol), the 3 outer streaks usually joined at alternate ends (Fig. 1), membrane darker, especially towards posterior. Underside dark or pitchy (ochre to brown, sometimes with areas of dark brown, in alcohol). Legs light ochre.

Structural characteristics. Head slightly longer than pronotum, vertex more convex than outline of eyes; posterior margin of eyes separated from posterior margin of head, especially medially. Interocular distance about same as eye width (interocular / eye width 1.17-1.29, mean 1.23, SD 0.05, n=8). Interocular distance 38% of head width. Antennae (Fig. 2a): distal section club-shaped, 7.5% of body length. Pronotum width to length ratio 3.31-3.67 (mean 3.52, SD 0.12, n=8), narrower than head by about 5% of head width. Hemelytra, except for posterior part of membrane, covered with hairs 20-30 µm long; several long (to 0.2 mm) thin hairs on right membrane. Metaxyphus acutely triangular (Fig. 2b), about 60-80°. Abdomen: strigil about 86 µm long, comb-like, with a single row of about 57 evenly spaced teeth; submedian process of 7th sternite as in Fig. 2d; free lobe of 8th tergite pigmented (Fig. 2c). Parameres: shaft of right paramere (Fig. 2e) parallel-sided for about first 2/3 of length, then slightly dilated before tapering to a blunt tip (Fig. 2h), basal process with an area of 20 ridges visible, 1.5-1.8 µm apart, adjoining an area of 14-16 ridges, 0.5-0.7 µm apart; left paramere curved, rather stout (Fig. 2f), with denticulate area towards distal end of stout section, then tapering to a point with a bird's head-like profile (Fig. 2g). Legs: femur of foreleg with 2 spine-like setae 1/3 of length from base and several thinner setae near base (Fig. 2i). Length of femora 0.4 mm, 12% of body length. One long, stout, spine-like seta 1/3 of length from distal end of tibia and a thinner long seta (about 0.1 mm) nearer distal end (Fig. 2i). Palar claw club-shaped when flattened under cover-slip (Fig. 2j) but normally elongate, concave laterally and longitudinally (Fig. 2i). Middle femora 1.3-1.4 mm long, 39% of body length; middle tarsal claws 0.5 mm long, almost as long as tarsus. Hind femora 0.7-0.8 mm long, 21.8% of body length.

Acoustic signals. Except at low temperatures (below about 15°C) acoustic signals sound like short bursts of an umpire's whistle. At 20°C each signal is about 1/4 second long and usually consists of 5-10 pulse-trains (mean 7.6), with a mean IPTI of 32 ms. It is this fast pulse-train rate which gives this species its whistle-like sound.

Comparative notes. The dorsal body proportions and colours of live males of *M. dixonia* are similar to *M. major* Chen but *M. major* is over 4 mm long. The anterior section of the clavus is light but not completely clear as in *M. major*. The diagnostic characters of *M. dixonia* are the acoustic signals

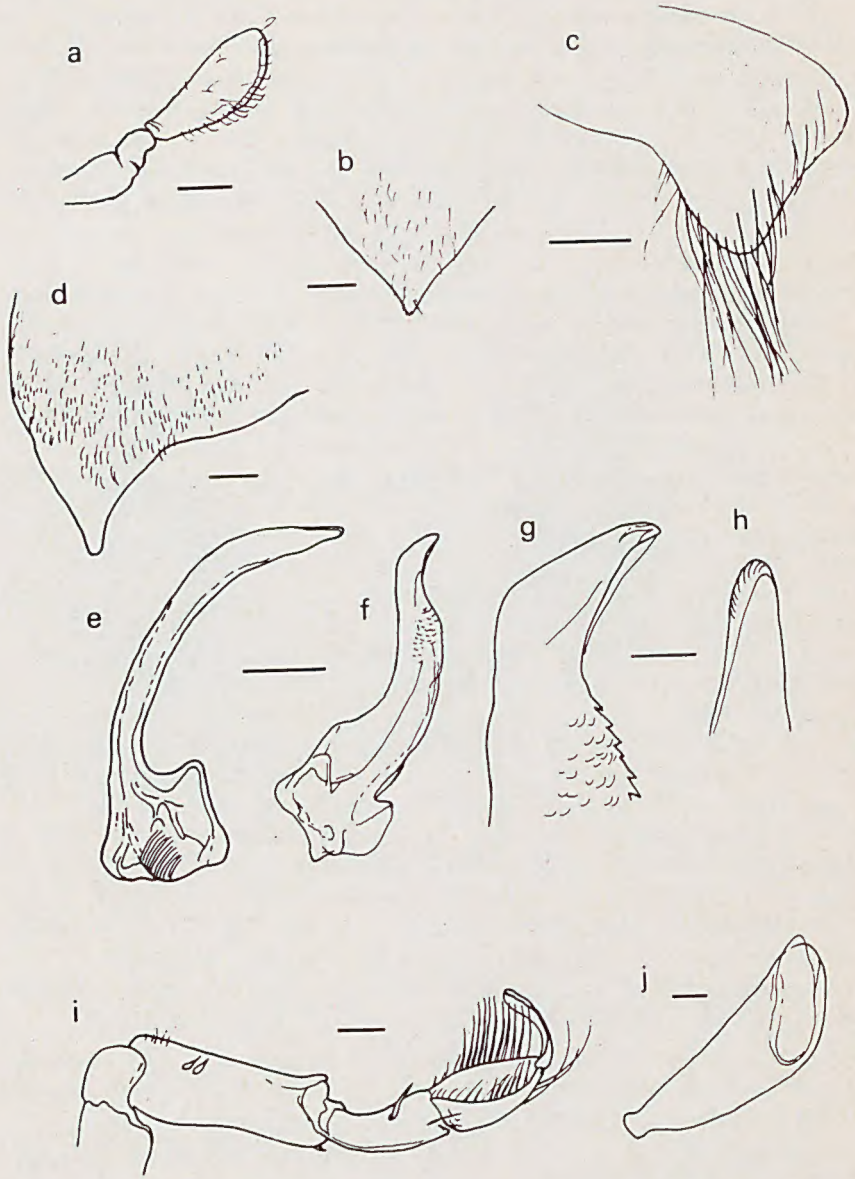

Fig. 2. *Micronecta dixonia* sp. nov. (a) antenna; (b) metaxyphus; (c) free lobe of 8th tergite; (d) submedian process of 7th sternite; (e) right paramere; (f) left paramere; (g) tip of left paramere; (h) tip of right paramere; (i) foreleg; (j) palar claw. All scale bars 0.1 mm except palar claw and tips of parameres 25 µm.

(males) and dorsal colouring of live specimens, especially the light anterior section of the clavi, in combination with body size and proportions. I was able to sort live *M. dixonia* from other dam species by dorsal appearance. The background colours, especially the light anterior section of the clavi, are still diagnostically useful with bugs in alcohol. I have only heard one other species of *Micronecta* with a pulse-train rate fast enough to produce a similar-sounding signal but that species (*M. annae* Kirkaldy) has a much longer signal and a different mean IPTI.

Known distribution. Several dams in Dixon's Creek area.

Etymology. The specific name is derived from Dixon's Creek.

***Micronecta concordia* sp. nov.** (Figs 1, 3)

Types. VICTORIA: Holotype ♂, from edge of large dam, "Merrinda" property, Beach's Lane, Dixon's Creek, 5.ix.1996, I. King. Paratypes: 6 ♂♂, same data as holotype (all in Museum of Victoria, Melbourne).

Description of male. Macropterous; body length 3.1-3.3 mm (mean 3.19, SD 0.07, n=12); body width 1.4-1.5 mm (mean 1.48, SD 0.02, n=12); length to width ratio 2.1-2.2 (mean 2.15, SD 0.03, n=12).

Colour and markings of live males (and in alcohol in parentheses). Head light ochre or greenish ochre with a median, longitudinal, faint, thin orange line (may be absent in alcohol); vertex sometimes slightly orange (not usual in alcohol); posterior margin suffused with light golden brown to medium brown, thin laterally and wider towards centre, where there is a dark brown tubercle. Pronotum usually with several transverse wrinkles when dry, medium greenish brown, with a darker brown fascia (absent or faint in alcohol) interrupted medially; posterior edge dark. Hemelytra medium greenish brown background, like pronotum; clavus with brown markings (less distinct in alcohol) sub-parallel to margins and darker posteriorly, anterior section with medium ochre background (may be darker in alcohol) but medium brown over most of area; corium with longitudinal markings as for *M. dixonia* (Fig. 1). Underside and legs as for *M. dixonia*.

Structural characteristics. Head longer than pronotum, vertex more convex than outline of eyes; posterior margin of eyes separated from posterior margin of head. Interocular distance about same as eye width (interocular / eye width 1.29-1.48, mean 1.35, SD 0.05, n=12). Interocular distance 40% of head width. Antennae (Fig. 3a): distal section similar to *M. dixonia*, 6.8% of body length. Pronotum width to length ratio 3.25-3.75 (mean 3.50, SD 0.18, n=11), narrower than head by about 7% of head width. Hemelytra: hairs similar to *M. dixonia*. Metaxyphus acutely triangular (Fig. 3b), similar to *M. dixonia*. Abdomen: strigil about 72 μm long, comb-like, with a single row of 52-55 evenly spaced teeth; submedian process of 7th sternite as in Fig. 3d, with a long posterior point and longer hairs than in *M. dixonia*; free lobe of 8th tergite pigmented (Fig. 3c). Parameres: similar to *M. dixonia*

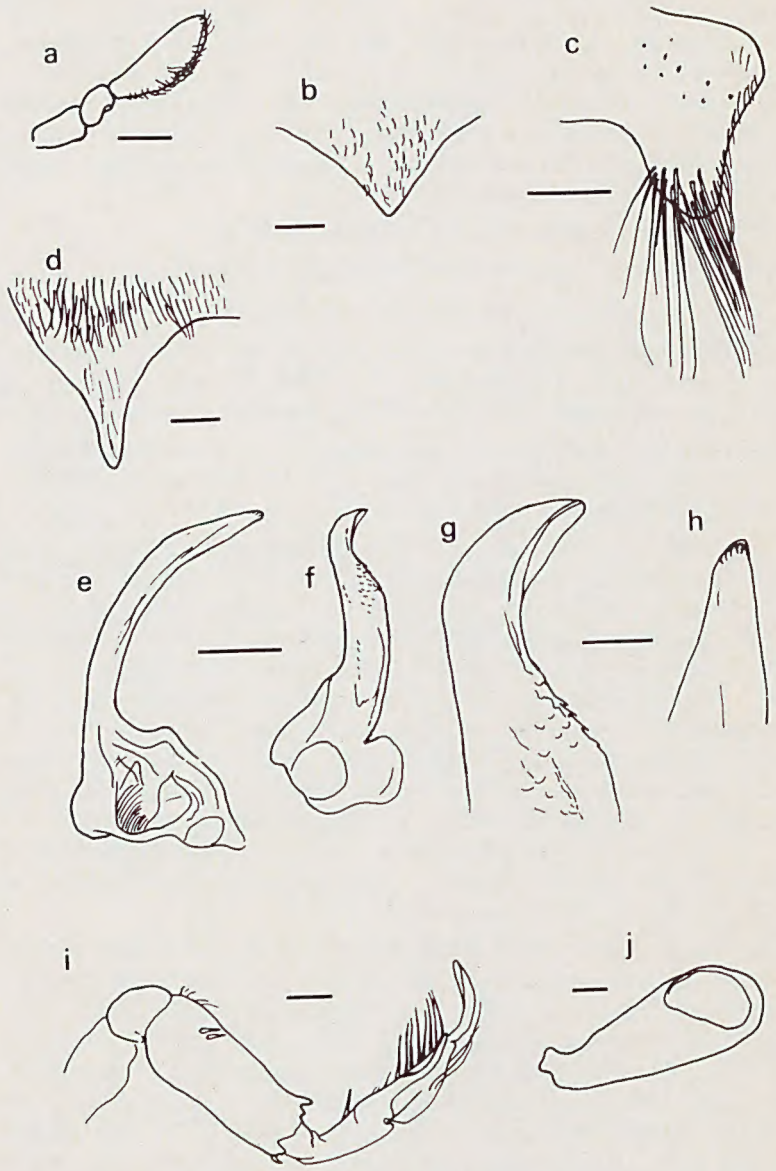

Fig. 3. *Micronecta concordia* sp. nov. (a) antenna; (b) metaxyphus; (c) free lobe of 8th tergite; (d) submedian process of 7th sternite; (e) right paramere; (f) left paramere; (g) tip of left paramere; (h) tip of right paramere; (i) foreleg; (j) palar claw. All scale bars 0.1 mm except palar claw and tips of parameres 25 μm.

(Figs 3e-h); ridges on basal process of right paramere also similar to *M. dixonia*, with an area of 21-27 ridges, 1.5-1.9 µm apart, adjoining an area of 9-17 ridges, 0.5-0.7 µm apart. Legs: description of forelegs, including palar claws, as for *M. dixonia* (Figs 3i-j); length of femora 0.4 mm, 12.5% of body length. Middle femora 1.3 mm long, 40.6% of body length; middle tarsal claws 0.5 mm long, almost as long as tarsus. Hind femora 0.66-0.76 mm long, 22.6% of body length.

Acoustic signals. Usually consist of 4 or 5 pulse-trains and are about 0.6-0.8 seconds long, at 20°C. Each pulse-train is heard separately, with a mean IPTI of 154 ms at 20°C. *M. concordia* chorusing was recorded in dams.

Comparative notes. The diagnostic characters of *M. concordia* are similar to those of *M. dixonia*: acoustic signals (males), dorsal colouring combined with body size and proportions. *M. concordia* and *M. dixonia* are remarkably similar in all the structures usually used diagnostically, except the submedian process of the 7th sternite. However, the difference between these two species in hemelytral background colour and especially the anterior sections of the clavi, is still apparent in alcohol. Also, interocular distance relative to head width is slightly different in these species (and this causes the slight difference in interocular distance / eye width, Wroblewski method). Two other sympatric species, *M. gracilis* Hale and *M. tasmanica* Wroblewski, also produce acoustic signals of mostly 4 or 5 pulse-trains but their IPTIs are different from each other and from those of *M. concordia*.

Known distribution. Many dams in the Yarra Valley, especially Dixon's Creek area; almost always by far the most common species.

Etymology. The specific name is derived from the Latin *concordia*, agreement, union, harmony, concord.

Discussion

Since the most reliable characters for distinguishing species of *Micronecta* are the acoustic signals and (usually) various characters of male morphology, only males whose signals were recorded are included in the type series. In the 8 species recorded, the mean body size of females was always slightly larger than that for males and colours and markings were similar, except in some species males were dark ventrally (especially in live bugs) but females were light.

Wroblewski (1970, 1977) described 3 subspecies of *Micronecta*, 2 of which have been found in Victoria: *M. annae tasmanica* and *M. annae illiesi*. I have recorded the sounds of both these subspecies plus *M. annae annae* and regard all 3 as valid species. Their hemelytral markings are different from each other, being completely absent in *M. tasmanica* stat. nov. and their acoustic signals are different. The left parameres of *M. annae* and *M. tasmanica* are different and I have collected the river species *M. annae* and *M. illiesi* stat. nov. from the same locality. Ivor Lansbury (pers. comm.) also considers *M. tasmanica* and *M. illiesi* to be valid species.

Micronecta concordia and *M. dixonia* were found living (and stridulating) in dams together with any or all of *M. tasmanica, M. robusta* Hale, *M. gracilis* and *M. major*. In almost all dams and at all times of the year, by far the most common species was *M. concordia*, followed by *M. tasmanica, M. robusta* and *M. gracilis*, although the proportions of species varied at different times. Acoustic signals from all 6 species were heard in the largest dam (250 m long) in the study area.

Considering all morphological characters, the most similar species of *Micronecta* are the two new species. In both species left and right parameres are also similar to *M. illiesi*, right parameres are similar to *M. annae* and left parameres are similar to *M. robusta*, which Wroblewski (1970) considered to be closely related to *M. annae*. These 5 species, together with *M. tasmanica*, belong to the group of species suggested by Wroblewski (1972).

I suspect that *M. concordia* may have been included with *M. annae* in some previous reports, for the following reasons: (1) their similarity in appearance; (2) Wroblewski's (1970) opinion that *M. annae* is the most common species in SE Australia; (3) reports of *M. annae* being found commonly in both dams and rivers; and (4) the left parameres of *M. annae* being different from (Wroblewski 1970) or similar to (Chen 1965) those of *M. concordia*. Song has proven useful in distinguishing between morphologically similar species of Orthoptera (Alexander 1962, Rentz 1985) and it is also useful in *Micronecta*.

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References

ALEXANDER, R.D. 1962. The role of behavioral study in cricket classification. *Systematic Zoology* **11:** 53-72.

CHEN, L-C. 1965. A revision of *Micronecta* of Australia and Melanesia (Heteroptera: Corixidae). *Kansas University Science Bulletin* **46:** 147-165.

HALE, H.M. 1922. Studies in Australian aquatic Hemiptera. No. 1. *Records of the South Australian Museum* **2:** 309-330.

RENTZ, D.C.F. 1985. *A monograph of the Tettigoniidae of Australia. Vol. 1. The Tettigoniinae*. ix + 384 pp; CSIRO, Canberra, E.J. Brill, Leiden.

WROBLEWSKI, A. 1970. Notes on Australian Micronectinae (Heteroptera, Corixidae). *Polskie Pismo Entomologiczne* **40:** 681-703.

WROBLEWSKI, A. 1972. Supplementary notes on Australian Micronectinae (Heteroptera, Corixidae). *Polskie Pismo Entomologiczne* **42:** 517-526.

WROBLEWSKI, A. 1977. Further notes on Australian Micronectinae (Heteroptera, Corixidae). *Polskie Pismo Entomologiczne* **47:** 683-690.